This key should allow you to understand why you choose the option you did (beyond just getting a question right or wrong). More instructions on how to use this key can be found here.

If you have a suggestion to make the keys better, please fill out the short survey here.

Note: This key is auto-generated and may contain issues and/or errors. The keys are reviewed after each exam to ensure grading is done accurately. If there are issues (like duplicate options), they are noted in the offline gradebook. The keys are a work-in-progress to give students as many resources to improve as possible.

---

1. Determine whether the function below is 1-1.

$$f(x) = -24x^2 + 4x + 580$$

The solution is no, which is option A.

A. No, because there is a y-value that goes to 2 different x-values.

* This is the solution.

B. No, because there is an x-value that goes to 2 different y-values.

Corresponds to the Vertical Line test, which checks if an expression is a function.

C. Yes, the function is 1-1.

Corresponds to believing the function passes the Horizontal Line test.

D. No, because the range of the function is not $(-\infty, \infty)$.

Corresponds to believing 1-1 means the range is all Real numbers.

E. No, because the domain of the function is not $(-\infty, \infty)$.

Corresponds to believing 1-1 means the domain is all Real numbers.

General Comment: There are only two valid options: The function is 1-1 OR No because there is a y-value that goes to 2 different x-values.

---

2. Find the inverse of the function below. Then, evaluate the inverse at $x = 7$ and choose the interval that $f^-1(7)$ belongs to.

$$f(x) = e^{x-4} - 2$$

The solution is $f^{-1}(7) = 6.197$, which is option E.

A. $f^{-1}(7) \in [-1.91, -1.76]$

This solution corresponds to distractor 1.

B. $f^{-1}(7) \in [-0.95, -0.87]$

This solution corresponds to distractor 4.

C. $f^{-1}(7) \in [-0.02, 0.51]$

This solution corresponds to distractor 3.

D. $f^{-1}(7) \in [-0.52, -0.32]$

This solution corresponds to distractor 2.

E. $f^{-1}(7) \in [5.63, 6.64]$

This is the solution.

General Comment: Natural log and exponential functions always have an inverse. Once you switch the x and y, use the conversion $e^y = x \leftrightarrow y = \ln(x)$.

---

3. Multiply the following functions, then choose the domain of the resulting function from the list below.

$$f(x) = 2x^2 + 7x + 8 \text{ and } g(x) = \sqrt{4x - 17}$$

The solution is The domain is all Real numbers greater than or equal to$x = 4.25$., which is option A.

A. The domain is all Real numbers greater than or equal to $x = a$, where $a \in [3.25, 7.25]$

B. The domain is all Real numbers except $x = a$, where $a \in [-5.75, -1.75]$

C. The domain is all Real numbers less than or equal to $x = a$, where $a \in [-1.5, 9.5]$

D. The domain is all Real numbers except $x = a$ and $x = b$, where $a \in [3.6, 10.6]$ and $b \in [-0.6, 7.4]$

E. The domain is all Real numbers.

General Comment: The new domain is the intersection of the previous domains.

---

4. Find the inverse of the function below (if it exists). Then, evaluate the inverse at $x = -15$ and choose the interval that $f^-1(-15)$ belongs to.

$$f(x) = \sqrt[3]{3x - 2}$$

The solution is -1124.3333333333333, which is option C.

A. $f^{-1}(-15) \in [1122.93, 1124.98]$

This solution corresponds to distractor 2.

B. $f^{-1}(-15) \in [-1126.09, -1125.21]$

Distractor 1: This corresponds to

C. $f^{-1}(-15) \in [-1124.91, -1123.2]$

* This is the correct solution.

D. $f^{-1}(-15) \in [1124.54, 1127.79]$

This solution corresponds to distractor 3.

E. The function is not invertible for all Real numbers.

This solution corresponds to distractor 4.

General Comment: Be sure you check that the function is 1-1 before trying to find the inverse!

---

5. Find the inverse of the function below. Then, evaluate the inverse at $x = 6$ and choose the interval that $f^-1(6)$ belongs to.

$$f(x) = e^{x+4} + 2$$

The solution is $f^{-1}(6) = -2.614$, which is option E.

A. $f^{-1}(6) \in [4.15, 5.18]$

This solution corresponds to distractor 4.

B. $f^{-1}(6) \in [3.83, 4.12]$

This solution corresponds to distractor 2.

C. $f^{-1}(6) \in [5.31, 5.63]$

This solution corresponds to distractor 1.

D. $f^{-1}(6) \in [2.13, 2.72]$

This solution corresponds to distractor 3.

E. $f^{-1}(6) \in [-2.81, -2.57]$

This is the solution.

General Comment: Natural log and exponential functions always have an inverse. Once you switch the x and y, use the conversion $e^y = x \leftrightarrow y = \ln(x)$.

---

6. Determine whether the function below is 1-1.

$$f(x) = (6x - 35)^3$$

The solution is yes, which is option A.

A. Yes, the function is 1-1.

* This is the solution.

B. No, because there is an x-value that goes to 2 different y-values.

Corresponds to the Vertical Line test, which checks if an expression is a function.

C. No, because there is a y-value that goes to 2 different x-values.

Corresponds to the Horizontal Line test, which this function passes.

D. No, because the range of the function is not $(-\infty, \infty)$.

Corresponds to believing 1-1 means the range is all Real numbers.

E. No, because the domain of the function is not $(-\infty, \infty)$.

Corresponds to believing 1-1 means the domain is all Real numbers.

General Comment: There are only two valid options: The function is 1-1 OR No because there is a y-value that goes to 2 different x-values.

---

7. Find the inverse of the function below (if it exists). Then, evaluate the inverse at $x = -13$ and choose the interval that $f^-1(-13)$ belongs to.

$$f(x) = \sqrt[3]{3x - 4}$$

The solution is -731.0, which is option A.

A. $f^{-1}(-13) \in [-731.4, -729]$

* This is the correct solution.

B. $f^{-1}(-13) \in [729.1, 731.8]$

This solution corresponds to distractor 2.

C. $f^{-1}(-13) \in [-735.7, -733.5]$

Distractor 1: This corresponds to

D. $f^{-1}(-13) \in [731.6, 734.4]$

This solution corresponds to distractor 3.

E. The function is not invertible for all Real numbers.

This solution corresponds to distractor 4.

General Comment: Be sure you check that the function is 1-1 before trying to find the inverse!

---

8. Multiply the following functions, then choose the domain of the resulting function from the list below.

$$f(x) = \sqrt{5x+21} \text{ and } g(x) = 8x + 8$$

The solution is The domain is all Real numbers greater than or equal to$x = -4.2$., which is option B.

A. The domain is all Real numbers except $x = a,$ where $a \in [-4.25, -2.25]$

B. The domain is all Real numbers greater than or equal to $x = a,$ where $a \in [-10.2, -3.2]$

C. The domain is all Real numbers less than or equal to $x = a,$ where $a \in [-6.5, -2.5]$

D. The domain is all Real numbers except $x = a$ and $x = b,$ where $a \in [-7.75, -0.75]$ and $b \in [0.25, 8.25]$

E. The domain is all Real numbers.

General Comment: The new domain is the intersection of the previous domains.

---

9. Choose the interval below that f composed with g at $x = -1$ is in.

$$f(x) = -x^3 - 2x^2 - 4x \text{ and } g(x) = x^3 - 1x^2 - 4x$$

The solution is -24.0, which is option D.

A. $(f \circ g)(-1) \in [-6, 3]$

Distractor 3: Corresponds to being slightly off from the solution.

B. $(f \circ g)(-1) \in [3, 14]$

Distractor 1: Corresponds to reversing the composition.

C. $(f \circ g)(-1) \in [-21, -16]$

Distractor 2: Corresponds to being slightly off from the solution.

D. $(f \circ g)(-1) \in [-30, -23]$

* This is the correct solution

E. It is not possible to compose the two functions.

General Comment: f composed with g at x means $f(g(x))$. The order matters!

---

10. Choose the interval below that f composed with g at $x = -1$ is in.

$$f(x) = -x^3 + 3x^2 + 4x - 3 \text{ and } g(x) = 3x^3 + 4x^2 - 2x - 4$$

The solution is -3.0, which is option D.

A. $(f \circ g)(-1) \in [-39, -33]$

Distractor 3: Corresponds to being slightly off from the solution.

B. $(f \circ g)(-1) \in [4, 7]$

Distractor 2: Corresponds to being slightly off from the solution.

C. $(f \circ g)(-1) \in [-44, -41]$

Distractor 1: Corresponds to reversing the composition.

D. $(f \circ g)(-1) \in [-3, 0]$

* This is the correct solution

E. It is not possible to compose the two functions.

General Comment: f composed with g at x means $f(g(x))$. The order matters!